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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ANTONIO S. CRUZ-URIBE,
DAVID C. COLLINS and JEFFREY ALLEN NIELSEN

Appeal 2008-2387
Application 10/620,860
Technology Center 1700

Decided: May 29, 2008

Before CHUNG K. PAK, JEFFREY T. SMITH, and
MICHAEL P. COLAIANNI, *Administrative Patent Judges*.

COLAIANNI, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 the final rejection of claims 1-42. We have jurisdiction over the appeal pursuant to 35 U.S.C. § 6(b).
We AFFIRM-IN-PART.

INTRODUCTION

Appellants claim a method for producing a three-dimensional object through solid freeform fabrication comprising selectively depositing containment material to form a boundary structure and depositing a flowable

build material within the boundary structure by flowing to the boundary structure (claim 1).

Claims 1, 7, 8, 17, 18, 27, 29, and 37 are illustrative:

1. A method for producing a three-dimensional object through solid freeform fabrication comprising:

selectively depositing containment material to form a boundary structure, wherein said boundary structure defines a surface of said object; and

depositing a flowable build material within said boundary structure, wherein said flowable build material forms a portion of said object by flowing to said boundary structure.

7. A method for producing an object through solid freeform fabrication comprising:

selectively depositing containment material to form a boundary structure with a high precision dispenser; and

depositing a flowable object build material into said boundary structure with a low precision dispenser.

8. The method of claim 7, further comprising depositing a sparse array support structure to support said boundary structure.

17. The method of claim 13, further comprising removing said boundary structure from said object build material after said solidification of said object build material.

18. The method of claim 17, wherein said removing said boundary structure comprises melting said boundary structure.

27. A method of producing an object through solid freeform fabrication comprising:

selectively depositing containment material to form a plurality of perimeter structures defining an outer surface of said object with a high precision dispenser; and

dispensing a volume of fluid build material interior to said perimeter structures.

29. The method of claim 27, wherein said dispensing a volume of fluid build material comprises adjusting said volume with a feedback control device.

37. A method of producing a porous object though solid freeform fabrication, said method comprising:

selectively depositing a first material with a high precision dispenser to form an outer boundary structure;

selectively depositing a smaller, internal boundary structure with said high precision dispenser; and

filling said outer boundary structure with a solidifiable build material, wherein said filling is performed by a low precision dispenser.

The Examiner relies on the following prior art references as evidence of unpatentability:

Greul (as translated) ¹	DE 19537264 A1	Apr. 10, 1987
Kieronski	6,364,986 B1	Apr. 2, 2002

The rejections as presented by the Examiner are as follows:

1. Claims 1-26, 37, and 39-42 are rejected under 35 U.S.C. § 102(b) as being unpatentable over Kieronski.
2. Claims 1-42 are rejected under 35 U.S.C. § 103 as being unpatentable over Kieronski.
3. Claims 1-26, and 39-42 are rejected under 35 U.S.C. § 102(b) as being unpatentable over Greul.
4. Claims 27-38 are rejected under 35 U.S.C. § 103 as being unpatentable over Greul.

¹ We refer to the April 2006 translation provided by Schreiber Translations, Inc. in the Opinion below. The pagination referenced in the Opinion corresponds to the translation pagination, not the pagination of the foreign language document.

Appellants separately argue claims 1, 7, 8, 18, 27, 29, 37, and 39. Claims 2-6, 9-17, 19-26, 28, 30-36, 38, and 40-42 are not separately argued by Appellants. Accordingly, with regard to rejections 1 and 2 above, we address Appellants' arguments regarding the rejections with respect to independent claims 1, 7, 27, 37, and 39 for reasons evident below. With regard to rejection 3 above, we address Appellants' arguments regarding the rejection with respect to claims 1, 7, 8, and 39. With regard to rejection 4 above, we address Appellants' arguments regarding the rejection with respect to claims 27, 29, and 37.

OPINION

35 U.S.C. § 102(b) AND § 103 REJECTIONS OVER KIERONSKI

Appellants argue that Kieronski fails to disclose “selectively depositing” material with a dispenser as claimed (Br. 8). Appellants contend that Kieronski discloses using stereolithography, which uses a laser to selectively cure resin in a tank so as to form the three-dimensional structure (Br. 8-9). Appellants contend that the definition of “selective deposition” in Paragraph [0028] of the Specification requires a material dispenser in contrast to Kieronski’s method (Br. 8-9).

In light of Appellants’ arguments and evidence, we do not sustain the Examiner’s § 102(b) and § 103 rejections over Kieronski for the reasons below.

During examination, claim terms are given their broadest reasonable interpretation consistent with the Specification. *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004). The Patent and Trademark Office applies to the claim terms the broadest reasonable

meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description contained in the applicant's Specification. *In re Morris*, 127 F.3d 1048, 1054 (Fed. Cir. 1997).

The Examiner contends that giving "selectively depositing" its broadest reasonable interpretation would include Kieronski's stereolithography process (Ans. 6-7). However, the standard applied during the examination process is not simply to give the broadest reasonable interpretation, but rather, to give the broadest reasonable interpretation *consistent with the Specification*. *Am. Acad. of Sci. Tech. Ctr*, 367 F.3d at 1364.

In the present appeal, Appellants' Specification indicates that "selective deposition" (i.e., "selectively depositing" as used in the claims) "is meant to be understood both here and in the appended claims as a method whereby the material dispensers (105) selectively deposit structural material that makes up the object forming boundary (109) using high precision dispensing methods . . ." (Spec. ¶ [0028]). "Material dispensers" are exemplified as being a printhead capable of selectively operating either as a high precision dispenser or a low precision dispenser (Spec. ¶ [0027]). "High precision dispenser" is defined as any dispensing equipment configured to perform a high precision process, and "lower precision dispenser" is defined as dispensing equipment that is configured to eject material according to a low precision process (Spec. ¶ [0022]).

Accordingly, "selectively depositing" as recited in independent claims 1, 7, 27, 37, and 39 requires material dispensers be used to deposit material.

In other words, material is ejected (i.e., conveyed) through a dispenser for deposition. In contrast, Kieronski's method uses a laser to selectively cure polymer material in a tank and form the three dimensional part; there is no dispensing of material using Kieronski's laser. Moreover, contrary to the Examiner's motivation (Ans. 6), we do not find Kieronski to suggest using material dispensers in lieu of the stereolithography process.

Accordingly, because Kieronski fails to teach "selectively depositing" the boundary layer as claimed and defined by Appellants, we do not sustain the Examiner's § 102(b) rejection of claims 1-26, 37, and 39-42. Furthermore, because Kieronski fails to teach or suggest the "selectively depositing" claim feature as defined and claimed by Appellants, we do not sustain the Examiner's § 103 rejection of claims 1-42 over Kieronski.

35 U.S.C. § 102(b) REJECTION OVER GREUL

CLAIMS 1, 7, 39

Appellants argue that Greul does not disclose selective deposition to form the boundary layer (Br. 11). Appellants contend that their definition of "selective deposition" (i.e., "selectively depositing" as claimed) excludes Gruel's formation of two halves of the hollow mold (i.e., boundary layer) on a form, which are subsequently united to form a hollow mold (i.e., boundary layer) (Br. 11).

We have considered Appellants' arguments and find them unpersuasive for the reasons below.

Greul discloses that the hollow mold is freeformingly produced in a rapid prototyping process by means of layered deposition (Greul, 4). Greul discloses that the hollow mold is formed in various layers in the process of

freeform molding so that the outermost layers (i.e., the layers that form the functional surface) fulfill the requirements placed on the component (Greul 5). Gruel discloses that the process used to form the three-dimensional object includes either forming a positive or negative mold to form the hollow mold; forming the hollow mold by casting a layer; demolding the hollow mold; attaching the two halves together if the positive mold is used; placing the hollow mold in tank surrounded by metal powder; and filling the hollow mold with molten material to form the three-dimensional object (Greul 6-7).

As noted above in our discussion of Kieronski, Appellants define “selective deposition” (i.e., “selectively depositing” as claimed) as requiring material dispensers to selectively deposit structural material to form the boundary using high precision dispensing methods (Spec. ¶ [0028]). Appellants further indicate that “‘high precision dispenser’ is meant to be understood broadly as any dispensing equipment configured to perform a high precision process” (Spec. ¶ [0022]).

We note that Appellants have not defined “high precision process.” *Webster’s* defines “precision” as “exactness, accuracy.”² *Webster’s* defines “high” as “greater in degree than usual.”³ Accordingly, a “high precision process” is reasonably understood as a process performed with a greater degree of accuracy or exactness.

Like the Examiner, we find that Greul’s freeform layered deposition process to form the hollow mold constitutes using material dispensers to deposit material in a high precision process. Specifically, the layered

² *Webster’s New World College Dictionary*, 1131 (4th Ed. 1999).

³ *Webster’s New World College Dictionary*, 672 (4th Ed. 1999).

deposition of the material to form the hollow mold uses material dispensers to deposit (i.e., cast, Greul 5) the material on a mold. Moreover, the process used is a high precision process in that material is deposited in such a way on the mold that the outermost layer fulfills the requirements placed on this component (i.e., the outermost layer form the functional surface of the finished component) (Greul 5). Greul's disclosure that the outermost layer is "*so thin*" that the properties of the component are not changed and are not determined thereby further indicates that the hollow mold layered deposition is preformed with a higher degree of accuracy than usual (Gruel 5).

We find that whether Greul uses a negative (i.e., the hollow mold is formed as a single piece) or positive mold (i.e., two halves of the hollow mold are formed which are subsequently united), Greul's disclosures indicate that dispensers are used to form the hollow mold with high precision process (i.e., the hollow mold is formed by "selective deposition" as defined by Appellants).

For the above reasons, we sustain the Examiner's § 102(b) rejection of claims 1-7, 9-17, 19-26, and 39-42.

CLAIM 8

In addition to the arguments indicated above regarding claim 7, Appellants argue none of the prior art references teaches or suggests depositing a sparse array support structure to support a deposited boundary structure (Br. 13).

Appellants define "sparse" as "widely spaced, scattered, or otherwise not densely packed" (Spec. ¶ [0022]).

Contrary to Appellants' argument, we find that Greul discloses that the hollow mold (i.e., the boundary material layer) may be embedded in a heavy metal powder before the filling procedure (Greul 7; Figure 1, Step 5). The heavy metal powder constitutes a deposited "sparse" array support of the boundary layer in that the powder is not densely packed. This interpretation of Greul is supported by the fact that after the molten material is filled into the hollow mold, the metal powder is removed so that the finished product may be extracted (Greul 7, Figure 1, Step 7).

Accordingly, we find that Greul discloses the argued claim feature and we sustain the Examiner's § 102(b) rejection of claim 8.

CLAIM 18

In addition to the arguments indicated above regarding claim 7, Appellants further argue that none of the prior art references teaches or suggests melting the boundary layer as recited in claim 18 (Br. 14).

Claim 18 recites "removing said boundary structure comprises melting said boundary structure." Moreover, claim 18 depends on claim 17, which recites that removing the boundary layer from the build material after solidification of the build material (Claim 17). Thus, the plain meaning of claim 18 is that the boundary layer is melted to remove it from the solidified boundary structure.

The Examiner determines that melting of the boundary layer is either inherently disclosed in Gruel or would have been obvious to one of ordinary skill in the art in view of Greul (Ans. 7-8). The Examiner's rejection of claim 18 is under § 102 alone. Accordingly, the Examiner's conclusion of obviousness is misplaced as obviousness is not the standard under § 102.

Examiner has not provided further explanation of the facts that led to this inherency determination. Gruel merely discloses that the hollow mold (i.e., the boundary layer) is melted by the molten material (i.e., the build material) so that it assimilates with the build material to form the functional surface of the object (Greul 5). Appellants' Specification clearly indicates that removal of the containment material (i.e., boundary structure) involves melting the containment material (i.e., boundary structure) from the three-dimensional object (i.e., melted off the build material) (Spec. ¶ [0044]). Greul does not disclose that the hollow mold (i.e., boundary layer) is removed by melting. Thus, we find that Greul does not inherently disclose the argued claim feature.

Because the argued claim 18 feature is not taught by Greul, we do not sustain the § 102(b) rejection of claim 18 over Greul.

35 U.S.C. § 103 REJECTION OVER GREUL

CLAIM 27

Appellants advance the same argument made regarding the § 102 rejection over Greul. Namely, that Greul does not teach or suggest selectively depositing containment material to form a boundary structure, wherein the boundary structure forms a surface of the object (Br. 11-12).

However, for the reasons given above, we find that Greul does teach the argued claim feature. Accordingly, Appellants' arguments are unpersuasive.

We sustain the Examiner's § 103 rejection of claims 27-28, and 31-36 over Greul.

CLAIM 29

Appellants argue that none of the prior art teaches or suggests a feedback control device as claimed (Br. 14).

The Examiner finds that using a feedback control loop would have been either inherent or obvious in Greul because adjustment of the build material volume is necessary in a solid freeform fabrication process (Ans. 8). We agree.

Greul discloses that the hollow mold (i.e., boundary layer) is filled with a molten material (Greul 7; Figure 1, Step 6; Figure 2, Step 6). Accordingly, to ensure complete filling of the molten material or filling to the level desired, a feedback control loop would have been obviously used by one of ordinary skill in the art.

Moreover, Appellants' claim 29 is not limited to any particular type of feedback control loop. In fact, Appellants' Specification indicates that any type of feedback device may be used to monitor the filling of the build material, which may reasonably include an operator's observation of the fill process and stopping or adding material as necessary (Spec. ¶ [0032]). Accordingly, it would have been obvious to include a feedback control loop with Greul's molten material filling process to ensure proper filling of the material into the hollow mold (i.e., boundary layer).

We sustain the Examiner's § 103 rejection of claims 29 and 30 over Greul.

CLAIM 37

Appellants have not provided any substantive arguments regarding whether the § 103 rejection over Greul is proper. Rather, based on

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Kieronski's apparent failure to disclose the "smaller internal boundary structure" claim feature, Appellants confusingly contend that the rejection of Greul should not be sustained (Br. 13).

For two reasons we are unpersuaded by Appellants' arguments. First, Appellants' arguments do not indicate why the Examiner's obviousness conclusion based on Greul is erroneous. Second, we agree with Examiner it would have been obvious to selectively deposit internal boundary structures in Greul in order to manufacture the desired final product. Greul's Figure 1 and 2 clearly show a part with a non-uniform surface/shape. Accordingly, shaping the hollow mold to fit the desired part shape, including hollow cavities formed by the internal boundary structure would have been obvious in view of Greul.

In view of these circumstances, we sustain the Examiner's § 103 rejection of claim 37 and 38 over Greul.

DECISION

We do not sustain the Examiner's § 102(b) rejection of claims 1-26, 37, and 39-42 over Kieronski.

We do not sustain the Examiner's § 102(b) rejection of claim 18 over Greul.

We do not sustain the Examiner's § 103 rejection of claims 1-42 over Kieronski.

We sustain the Examiner's § 102(b) rejection of claims 1-17, 19-26, and 39-42 over Greul.

We sustain the Examiner's § 103 rejection of claims 27-38 over Greul.

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The Examiner's decision is affirmed-in-part.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED-IN-PART

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